

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Currently Amended) A system for use in navigating an implantation of a selected construct, comprising:

a first member and a second member of the construct adapted to selectively interact with each other after implantation and operable to be fixed into a boney structure;

a third member positionable relative to said first member and said second member in an anatomical portion;

a first localization element fixed to said first member and a second localization element fixed to said second member;

a detector to detect said first localization element and said second localization element when said first localization element and said second localization element is associated with at least one of said first member or said second member; and

a processor operable to assist in navigation of said second member relative to said first member;

wherein said processor is operable to receive position information for all of said first member, said second member, and said third member from said detector and further operable to determine a relative position between all of said first member, said second member, and said third member;

wherein said relative position is operable to allow a navigation of said third member relative to at least one of said first member or said second member;

wherein said processor is operable to allow navigation of said third member relative to at least one of said first member or said second member in a substantially patient imageless manner; and

wherein said processor is operable to track said first localization element ~~remains~~ fixed to said first member and said second localization element ~~remains~~ fixed to said second member such that said first and second localization elements act as dynamic reference frames for said first and second members ~~while said third member is navigated.~~

2. (Original) The system of claim 1, wherein said first member includes a fastener operable to be fixed to a selected anatomical portion having a first fixable portion for being fixed to the selected anatomical portion and a second engageable portion to be connected to said second member;

wherein said second member includes a connector to operably interconnect said first member and a third member.

3. (Original) The system of claim 2, wherein said third member is selected from a group including a fastener, a connector, an anatomical portion, and combinations thereof.

4. (Currently Amended) The system of claim 1, wherein said first member and said second member are each fasteners having a fastener portion and an engageable portion;

wherein said third member is a connector ~~[[is]]~~. operable to interconnect said first member and said second member in a selected orientation.

5. (Previously Presented) The system of claim 1, wherein said localization element is selected from a group comprising an electromagnetic tracking device, an optical tracking device, a conductive tracking device, a fiberoptic tracking device, an acoustic tracking device, and combinations thereof.

6. (Original) The system of claim 1, wherein said detector is selected from the group comprising an electromagnetic detector, an optical detector, a conductive detector, a fiberoptic detector, an acoustic detector, and combinations thereof.

7. (Previously Presented) The system of claim 1, wherein said localization element includes:

an extender operable to be removably connected to at least one of said first member or said second member; and

a tracking element operable to be detected by said detector to detect the position of said tracking element in a detector space.

8. (Previously Presented) The system of claim 7, wherein said processor is operable to determine a position of at least one of said first member or said second member after detection of said tracking element by said detector.

9. (Original) The system of claim 7, wherein said localization element includes a plurality of localization elements such that each of said first member and said second member includes a localization element extending therefrom.

10. (Canceled)

11. (Previously Presented) The system of claim 1, further comprising:
a fourth member;
wherein said first member, said second member, and said third member are operable to be fixed relative to the anatomical portion;
wherein said processor is operable to determine a real time position of said fourth member relative to said first member, said second member, and said third member to substantially position said fourth member in a selected position relative to said first member, said second member, and said third member.

12. (Previously Presented) The system of claim 1, wherein said second member is substantially navigated at least one of percutaneously or minimally invasively.

13. (Original) The system of claim 1, wherein said first member and said second member are portions of a construct selected from a group including an acetabular implant, a spinal fixation implant, a spinal fusion implant, a humeral implant, a femoral head implant, a knee implant, a bone plate implant, and combinations thereof.

14. (Previously Presented) The system of claim 1 further comprising:
a navigable needle positionable relative to at least one of said first member or said second member such that said navigation system is operable to determine a position for a third member relative to said of at least one of said first member or said second member.

15. (Previously Presented) The system of claim 1, wherein said processor assists in providing an alignment of said of at least first member or said second member in at least two planes.

16. (Canceled)

17. (Previously Presented) The system of claim 15, wherein said first member is selected from at least one of a screw or a connector and wherein said second member is selected from at least one of the other of said screw or said connector.

18. (Original) The system of claim 17, wherein said connector is selected from a group comprising a substantially rigid rod, a steerable connector, a deformable connector, a flexible connector, and combinations thereof.

19. (Canceled)

20. (Previously Presented) The system of claim 1, wherein said display displays at least one of said first member or said second member with an icon.

21. (Previously Presented) The system of claim 20, wherein said display displays an atlas map superimposed over said icons of said at least first member or said second member.

22. (Currently Amended) A system for use in determining a position of a first implantable member and planning and navigating relative to the first member for positioning a second member to interact with said first member, the system comprising:

the first member including a bone engaging portion for fixation to a boney structure;

a tracking element interconnected with the first member operable to be used to determine a position of the first member;

a first detector to detect said tracking element;

a processor to determine a position of the first member depending upon the detection of said first detector;

a navigable instrument operable to move the second member relative to the first member; and

a second detector to detect said navigable instrument;

wherein the tracking element remains connected to the first member during the movement of the navigable instrument;

wherein said processor is operable to determine a position of the second member relative to the first member in at least two planes;

wherein said processor is operable to navigate said navigable instrument relative to said tracking element for positioning of the second member relative to the first member in a substantially patient imageless display; and

wherein said processor is operable to track the tracking element fixed to said first member such that the tracking element acts as a dynamic reference frame for said first member.

23. (Original) The system of claim 22, wherein said first detector and said second detector are a single detector.

24. (Currently Amended) The system of claim 23, wherein said detector is selected from the group comprising ~~and the~~ an electromagnetic detector, an optical detector, a conductive detector, a fiber optic detector, an acoustic detector, and combinations thereof.

25. (Original) The system of claim 22, wherein said navigable instrument is operable to engage the second member to move the second member relative to the first member.

26. (Previously Presented) The system of claim 22, wherein said processor is operable to navigate said navigable instrument relative to said tracking elements such that said second member is moved to a selected position relative to said first member substantially at least one of percutaneously or minimally invasively.

27. (Previously Presented) The system of claim 22, further comprising:
an imaging device to acquire a patient image of a selected portion relative to at least one of the first member or the second member to confirm the displayed position of at least one of the first member or the second member.

28. (Previously Presented) The system of claim 22, wherein said processor provides an alignment along at least two planes relative to the first member or the second member.

29. (Original) The system of claim 28, wherein said planes are substantially orthogonal.

30. (Original) The system of claim 22, wherein said processor determines the position of the first member and the second member in a substantially patient imageless manner.

31. (Original) The system of claim 30, further comprising:
a display to display a first icon to represent a position of the first member and a second icon to represent a position of the second member relative to said first member.

32. (Original) The system of claim 31, wherein said processor superimposes an atlas model over the first icon and the second icon.

33. (Currently Amended) A method of implanting a construct having at least a first member, a second member, or a third member, the method comprising:

positioning the first member into a boney structure;

determining a position of the first member in a selected space with a first tracking element connected to the first member;

positioning the second member relative to the first member;

determining a position of the second member in the selected space with a second tracking element connected to the second member;

navigating the third member relative to the first member and the second member, while maintaining the first ~~tacking~~ tracking element connected with the first

member and maintaining the second tracking element connected to the second member, including:

tracking the first tracking element connected to the first member and the second tracking element connected to the second member such that the first and second tracking elements act as dynamic reference frames for the first and second members;

determining a real time optimal position of the third member in the selected space; and

determining a real time position of the third member relative to at least one of the first member or the second member;

displaying on a display the determined real time optimal position of the third member; and

displaying an icon to represent the position of at least two of the first member, the second member, or the third member in a substantially patient imageless manner.

34. (Previously Presented) The method of claim 33, further comprising saving at least one of the determined position of the first member or the determined position of the second member.

35. (Previously Presented) The method of claim 33, wherein determining a position of at least one of said first member or said second member includes:

operably interconnecting a tracking element to at least one of said first member or said second member; and
detecting the position of the tracking element.

36. (Original) The method of claim 35, wherein said tracking element is selected from a group comprising an electromagnetic tracking device, an optical tracking device, a conductive tracking device, a fiber optic tracking device, an acoustic tracking device, and combinations thereof.

37. (Original) The method of claim 35, further comprising determining a selected alignment relative to said determined position of the first member and said determined position of the second member.

38. (Previously Presented) The method of claim 37, further comprising:
selecting a characteristic of at least one of the first member, the second member or the third member from a group including a length, a radius, a diameter, an offset, a flexibility, an alignment, or combinations thereof.

39. (Previously Presented) The method of claim 33, further comprising:
verifying a final position of the third member relative to at least one of the first member or the second member.

40. (Currently Amended) The method of claim 39, wherein verifying the position of the third member includes obtaining ~~[[a]]~~ an image of an area including at least one of the first member or the second member and said third member.

41. (Original) The method of claim 33, further comprising:
displaying the determined real time position of said third member on a display;
wherein said display assists a user in moving the third member relative to the optimal position.

42. (Original) The method of claim 33, further comprising:
selecting a characteristic of the third member for implantation relative to the first member and the second member; and
positioning a fourth member relative to said first member and said second member to be interconnected by said third member in the selected orientation.

43. (Original) The method of claim 33, wherein determining a real time optimal position includes determining a real time optimal position along at least two planes for the third member.

44. (Original) The method of claim 43, wherein said two planes are substantially orthogonal to each other.

45. (Previously Presented) The method of claim 33, further comprising:
determining a contour of a soft tissue relative to at least one of the first member, the second member, or the third member;

wherein determining a real time optimal position includes determining an insertion point through the soft tissue for the third member.

46. (Original) The method of claim 45, wherein determining a contour of the soft tissue includes moving a navigable probe relative to the soft tissue.

47. (Previously Presented) The method of claim 33, wherein positioning the first member, positioning the second member, and navigating the third member includes at least one of percutaneous or minimally invasively placements of at least one of a pedicle screw or a connector.

48. (Previously Presented) The method of claim 47, wherein navigating the third member includes at least one of percutaneously or minimally invasively moving the third member relative to the first member and the second member to interconnect the first member and the second member.

49. (Canceled)

50. (Previously Presented) The method of claim 33, wherein at least one of determining a position of the first member or determining a position of the second

member includes associating a trackable probe to at least one of the first member or the second member.

51. (Canceled)

52. (Previously Presented) The method of claim 33, wherein determining a real time position of the third member includes knowing substantially only the position of the third member relative to at least one of the first member or the second member.

53. (Currently Amended) A method of implanting a construct of at least a first member, a second member, or a third member substantially at least one of percutaneously or minimally invasively, comprising:

selecting a final orientation of at least one of the first member, the second member, or the third member relative to at least one other of the first member, the second member, or the third member;

tracking determining the position of the first member or the second member in order to provide a dynamic reference frame;

displaying said position of each of said first member and the second member as two or more icons on a display;

selecting a characteristic of at least one of said first member, said second member, or said third member;

navigably positioning at least one of said first member, said second member, or said third member relative to another of at least one of said first member,

said second member, or said third member to achieve the selected final orientation with assistance of said icons; and

displaying an additional icon relative to the two or more icons to illustrate a position of at least one of said first member, said second member, or said third member in a substantially patient imageless manner.

54. (Currently Amended) The method of claim 53, further comprising:
positioning the first member and the second member substantially at least one of percutaneously or minimally invasively relative to a selected anatomical portion; and

detecting a position of a navigational element relative to said first member and said second member to determine the position of the first member and the second member.

55. (Currently Amended) The method of claim 54, wherein said detector is selected from the group comprising ~~and the~~ an electromagnetic detector, an optical detector, a conductive detector, a fiber optic detector, an acoustic detector, and combinations thereof.

56. (Previously Presented) The method of claim 53, wherein at least one of the first member, the second member, or the third member is selected from a group including a fastener, a rod, an acetabular cup, a femoral component, a tibial component, a glenoid component, a bone plate, and combinations thereof.

57. (Original) The method of claim 53, wherein displaying a position includes forming a graphical representation of the determined position of the first member and the second member and displaying it in user readable format.

58. (Previously Presented) The method of claim 53, wherein selecting a characteristic of at least one of the first member, the second member or the third member includes selecting a characteristic from a group including a length, a radius, a diameter, an offset, a flexibility, an alignment, and combinations thereof.

59. (Previously Presented) The method of claim 53, further comprising:

navigably positioning the third member including:

moving a substantially steerable catheter relative to the first member and the second member; and

displaying a real time position of at least a portion of the third member relative to the first member or and the second member.

60. (Previously Presented) The method of claim 53, wherein selecting the final orientation includes selecting at least one of an alignment in a first plane or an alignment in a second plane.

61. (Original) The method of claim 60, further comprising positioning a fourth member relative to the first member and the second member to assist in achieving the selected final orientation.

62. (Previously Presented) The method of claim 61, further comprising:
navigably positioning the third member including:
moving the third member relative to at least one of the first member, the second member, or the fourth member to substantially fix the construct in the selected final orientation.

63. (Original) The method of claim 53, further comprising:
obtaining a patient image to verify the positioning of the first member, the second member, and the third member in the selected final orientation.

64. (Previously Presented) The method of claim 53, further comprising:
selecting a pedicle screw for at least one of the first member, the second member, or the third member and a connector for at least one of another of the first member, the second member, or the third member.

65. (Previously Presented) The method of claim 64, wherein navigably positioning at least one of the first member, the second member, or the third member includes:

positioning at least a first screw relative to second screw to allow for interconnection in a selected alignment.

66. (Previously Presented) The method of claim 64, wherein navigably positioning at least one of the first member, the second member, or the third member includes:

displaying a movement of the connector relative to substantially only at least one of the screws.

67. (Currently Amended) A system for use in determining a position of a first implantable member and planning and navigating relative to the first member for positioning a second member to interact with said first member, the system comprising:

a display to display a first icon to represent a position of the first member and a second icon to represent a position of the second member relative to said first member;

a tracking element attached to a moveable head of the first member to assist in determining a position of the first member;

a detector to detect said tracking element;

a processor to determine a position of the first member depending upon the detection of said detector; and

a navigable instrument operable to move the second member relative to the first member while the first member is fixedly implanted into a boney structure of an anatomy with the tracking element attached thereto; [[and]]

wherein said processor is operable to determine a position of the second member relative to the first member in at least one plane;

wherein the display is operable to illustrate the first icon and the second icon in a substantially patient imageless manner for navigation of the first member relative to the second member;

wherein said processor is operable to navigate said navigable instrument relative to said tracking element for positioning of the second member relative to the first member; and

wherein said processor is operable to track said tracking element attached to the first member such that said tracking element acts as a dynamic reference frame for the first member.

68. (Previously Presented) The system of claim 67, wherein said detector is selected from the group comprising an electromagnetic detector, an optical detector, a conductive detector, a fiber optic detector, an acoustic detector, and combinations thereof.

69. (Previously Presented) The system of claim 67, wherein said processor is operable to navigate said navigable instrument relative to said tracking elements such that said second member is moved to a selected position relative to said first member substantially at least one of percutaneously or minimally invasively.

70. (Previously Presented) The system of claim 67, further comprising:

an imaging device to acquire a patient image of a selected portion relative to at least one of the first member or the second member to confirm the displayed position of at least one of the first member or the second member.

71. (Original) The system of claim 67, wherein said processor provides an alignment along at least two planes relative to the first member and the second member.

72. (Original) The system of claim 71, wherein said planes are substantially orthogonal.

73. (Original) The system of claim 67, wherein said processor determines the position of the first member and the second member in a substantially patient imageless manner.

74. (Canceled)

75. (Previously Presented) The system of claim 67, wherein said processor imposes a selected anatomized model image relative to the first icon and the second icon.

76. (Original) The system of claim 75, wherein said selected anatomical model image is a patient acquired image displayed on the display relative to the first icon and the second icon.

77. (Previously Presented) The system of claim 67, further comprising: a third member and a fourth member wherein said processor is operable to determine a point for each of the first member, the third member, and the fourth member;

wherein said second member is operable to be navigated relative to each of the first member, third member, and fourth member.

78. (Currently Amended) The system of claim 2, wherein said fastener includes a screw with a shank and an adjustable head operable to ~~be~~ positioned into a vertebra;

wherein said localization element is operable to be connected to said adjustable head;

wherein said processor is operable to determine a position of the adjustable head.

79. (Previously Presented) The system of claim 63, wherein said first member includes a screw with a shank and the adjustable head operable to be positioned into a vertebra;

wherein said tracking element is operable to be connected to said adjustable head;

wherein said processor is operable to determine a position of the adjustable head and display the first icon to illustrate the determined position of the adjustable head.

80. (Currently Amended) The system of Claim 7, wherein each of the tracking elements are structurally different such that ~~unequally identifiable by~~ said detector or said processor ~~[[to]]~~ can uniquely identify each of said first member and said second member.

81. (New) The system of claim 1, wherein said processor is operable to track said first localization element fixed to said first member and said second localization element fixed to said second member with six degrees of freedom.

82. (New) The system of claim 1, wherein said first localization element engages with said first member and locks said first member in a selected position and a selected orientation.

83. (New) The system of claim 82, wherein said first localization element includes a depressible member coupled to a mechanism that selectively engages and disengages with said first member.

84. (New) The system of claim 22, wherein said processor is operable to track the tracking element fixed to said first member with six degrees of freedom.

85. (New) The system of claim 22, wherein the tracking element engages with said first member and locks said first member in a selected position and a selected orientation.

86. (New) The system of claim 85, wherein said tracking element includes a depressible member coupled to a mechanism that selectively engages and disengages with said first member.

87. (New) The method of claim 33, wherein the tracking step comprises tracking the first tracking element connected to the first member and the second tracking element connected to the second member with six degrees of freedom.

88. (New) The system of claim 33, wherein said first tracking element engages with said first member and locks said first member in a selected position and a selected orientation.

89. (New) The system of claim 88, wherein said first tracking element includes a depressible member coupled to a mechanism that selectively engages and disengages with said first member.

90. (New) The method of claim 53, wherein the tracking step comprises tracking the position of the first member or the second member with six degrees of freedom.

91. (New) The system of claim 67, wherein said processor is operable to track said tracking element attached to the first member with six degrees of freedom.

92. (New) The system of claim 67, wherein said tracking element engages with said first member and locks said first member in a selected position and a selected orientation.

93. (New) The system of claim 92, wherein said tracking element includes a depressible member coupled to a mechanism that selectively engages and disengages with said first member.